The CDM, Kyoto protocol and the sugar, ethanol and bio-fuels industry

By Ben Atkinson
Agrinergy Ltd., Windmill Cottage, Tarrant Gunville, Blandford, Dorset DT11 8JW, UK
Tel: +44 (0)1258 830556  Fax: +44 (0)1258 830556  Email: ben.atkinson@agrinergy.com
Web: www.agrinergy.com

Abstract

The United Nations Framework Convention on Climate Change (UNFCCC) and the associated Kyoto Protocol set in place a structure for the stabilisation of global greenhouse gas (GHG) emissions. The Kyoto Protocol commits participating industrialised countries to binding emission reduction commitments and introduces flexibility mechanisms, including emissions trading and the CDM. Under the CDM, emission reductions from project activities undertaken in developing (or non-Annex 1) countries may be utilised by industrialised countries to help meet their emission reduction commitments. Rules, procedures and methodologies for the implementation of CDM projects are emerging, and the market for emission reduction certificates or “carbon credits” is rapidly expanding. The sugar industry is well placed to benefit from carbon finance under the CDM, and to date a number of bagasse cogeneration CDM projects have been implemented. The role of fuel ethanol and other liquid bio-fuels in the CDM is less advanced, but the CDM will play an important role in the development and diffusion of renewable transport fuels.

Introduction

The climate change agenda and carbon emissions market is rapidly evolving. The sugar industry, which has great potential for the production of renewable energy, is well placed to benefit from these developments. The market for “carbon credits” has its origins in the Kyoto Protocol. Kyoto will enter into force once ratified by Russia, but developments in the EU, and to a lesser extent Canada and Japan, coupled with an expectation that Kyoto will soon enter into force, mean that the volume of transactions and market activity is increasing. This paper outlines the United Nations Convention on Climate Change (UNFCCC), Kyoto Protocol and the Clean Development Mechanism (CDM) opportunity. An evaluation of the development of CDM methodologies and infrastructure is given, with a concrete example of a CDM project in the sugar sector. Finally, the role of ethanol and other liquid bio-fuels in the CDM is discussed.

UNFCCC

In 1992, recognising the danger that rising levels of greenhouse gases (GHG) posed to the global environment, the world’s governments adopted the United Nations Framework Convention on Climate Change (UNFCCC). The Convention sets an ultimate objective of stabilizing atmospheric concentrations of greenhouse gases at levels that would prevent “dangerous” human interference with the climate system.

The Convention divided countries into Annex 1 Parties and non-Annex 1 Parties. Annex 1 Parties (currently numbering 41) are the industrialized countries who have historically been significant contributors to climate change. They include the wealthy industrialized countries that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (the EITs). All remaining, essentially developing, countries make up the group of non-Annex 1 Parties, currently numbering 145.

Since the Convention’s entry into force, Parties have met annually in the Conference of the Parties (COP) to monitor its implementation and continue talks on how best to tackle climate change. The last COP – COP 9 – took place in Milan in December 2003.

Kyoto Protocol

When governments adopted the UNFCCC, they knew that the commitments would not be sufficient to seriously tackle climate change. At COP 1 (Berlin, March/April 1995), in a decision known as the Berlin Mandate, Parties therefore launched a new round of
talks to decide on stronger and more detailed commitments for industrialized countries. After two and a half years of negotiations, the Kyoto Protocol was adopted at COP 3 in Kyoto, Japan, on 11 December 1997.

The 1997 Kyoto Protocol shares the UNFCCC’s objective, principles and institutions, but significantly strengthens the Convention by committing Annex I Parties to individual, legally-binding targets to limit or reduce their greenhouse gas (GHG) emissions. The individual targets for Annex I Parties are listed in the Kyoto Protocol’s Annex B. These add up to a total cut of at least 5% from 1990 levels in the 2008-2012 commitment period.

The GHG emissions covered by Kyoto consist of: Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur hexafluoride (SF6). Carbon dioxide contributes the most to global warming, and therefore the other GHGs are accounted for in terms of CO2e, with the “e” representing the equivalence of global warming potential. Emission commitments and emission reduction credits are therefore denominated in tonnes of CO2e.

The Kyoto protocol incorporates the “flexibility” mechanisms - instruments designed to help Annex I Parties reduce the economic cost of meeting their emissions targets. These mechanisms consist of Joint Implementation (JI), the Clean Development Mechanism (CDM) and emissions trading. Any Annex I Party that has ratified the Protocol may use these mechanisms to help meet its emissions target. However, Parties must provide evidence that their use of the mechanisms is “supplemental to domestic action”, which must constitute “a significant element” of their efforts in meeting their commitments.

The CDM

The Clean Development Mechanism (CDM) is set out in Article 12 of the Protocol. Under the CDM, Annex I Parties may implement projects in non-Annex I Parties that reduce emissions, and use the resulting certified emission reductions (CERs) to help meet their own targets. The CDM also aims to help non-Annex I Parties to contribute to and achieve sustainable development.

The Protocol envisages a prompt start to the CDM, allowing CERs to accrue from projects from the year 2000 onwards. However, uncertainty surrounding the Kyoto process and the CDM regulations and procedures, has tended to mitigate wide-spread project development.

The CDM Executive Board (EB) supervises the CDM and is responsible for day-to-day activities relating to the CDM. These activities include the designation of operational entities, registration of CDM projects and issuance of CERs.

The CDM EB held its first meeting in November 2001. It is made up of ten members, including one from each of the five official UN regions, one from the small island developing states, and two members each from Annex I and non-Annex I Parties.

To carry out a CDM project, the EB outlines a number of distinct steps. The first step is project design, formalised in the project design document (PDD). The PDD must then be validated by a Designated Operational Entity (DOE). DOEs are designated by the EB to ensure that CDM projects meet the criteria set down by the COP and EB.

In order for a PDD to be validated, the document must either follow a methodology that has been approved by the EB, or must propose a new methodology. If a new methodology is proposed, the PDD is first submitted to the Meth. Panel of the EB. The Meth. Panel makes a recommendation to the EB as to the extent the methodology fulfills the criteria laid down in the Marrakech accords. It is the EB, however, that takes the final decision as to the applicability of the methodology.

Following validation of a project, it can be registered with the EB. On registration, a project can begin to receive CERs. The volume of CERs issued is dependent on the results of periodic verification exercises carried out by a DOE.

What projects qualify under the CDM?

The core criteria for a CDM project is that it results in real, measurable and long-term benefits related to the mitigation of climate change and results in emission reductions that are additional to any that would occur in the absence of the certified project activity. In essence, any activity that results in a reduction in GHG emissions below those that would have occurred under the “business as usual” scenario can qualify as a CDM project. With these criteria in mind, core to the CDM are the concepts of the baseline, additionality and leakage.

The baseline represents an evaluation of the likely development and GHG emissions from the relevant sector in the absence of the CDM. Thus for a renewable energy project, the baseline scenario might be that in the absence of the CDM, a coal powered generation plant would be installed. In this way, the baseline is used to calculate the volume of GHG emissions that are avoided by the proposed CDM project. In designing a CDM project and producing a baseline estimate, it is therefore necessary to show that the project itself is not part of the baseline (additionality). The CDM Executive Board has provided examples of tools that may be used to this end. They include:

- A flow-chart or series of questions that lead to a narrowing of potential baseline options; and/or
- A qualitative or quantitative assessment of different potential options and an indication of why the non-project option is more likely; and/or
- A qualitative or quantitative assessment of one or more barriers facing the proposed project activity (such as those laid out for small-scale CDM projects); and/or
- An indication that the project type is not common practice (e.g. occurs in less than [x%] of similar cases) in the proposed area of implementation, and not required by a Party’s legislation/regulations.

CDM project developers must show that the project does not lead to increased emissions (or a lower reduction in emissions) elsewhere - leakage.

Turning to specific types of project, to date, a total of 38 project methodologies have been submitted to the CDM Executive Board. Six methodologies have been rejected and nine approved, with the remainder currently undergoing evaluation. Of the total of 38 project methodologies, 10 have been in the biogas/biomass area. One bagasse/biomass and one biogas project methodology have been rejected, and one biomass and one bagasse project approved. To date no liquid bio-fuel project methodologies have been submitted. In the first tranches of project methodologies, there was a bias
towards projects dealing with landfill gases and renewable energy projects, essentially because these projects present relatively straightforward methodologies. Although recent project methodology submissions have been of a more diverse nature, renewable energy projects are expected to contribute to a large share of CDM projects and resultant CERs.

Sinks

At COP 9 that took place in Milan in December 2003, a final piece in the CDM jigsaw was resolved – the rules for inclusion of sinks in the CDM. Afforestation and reforestation projects that sequester CO₂ can now qualify under the CDM, offering the interesting possibility of combining bio-energy and agro-forestry CDM projects.

Concrete examples of CDM projects worked on by Agrinergy

As part of its core business, Agrinergy has been actively assisting in the development and transaction of CDM projects in the sugar sector. The following text gives an overview of an illustrative bagasse cogeneration CDM project that Agrinergy has worked on:

- 9.3 MW small scale bagasse cogeneration expansion project, India. This project involves an expansion of cogeneration capacity through the installation of a new boiler and generator at a sugar mill. The expansion will utilise excess own bagasse and purchased biomass for generation and export of electricity to the grid. Agrinergy has been involved in the project from an early stage, and completed the PDD following the small scale procedures. The project is currently being validated by an Applicant Operational Entity, and we expect the project to be registered and generating CERs in 2004. Revenue from the sale of CERs from this project is expected to be in excess on US$1 million.

The role of ethanol and other liquid bio-fuels in the CDM

Fuel ethanol and other liquid bio-fuels are likely to benefit in both Annex 1 and non-Annex 1 countries as a result of the Kyoto Protocol. GHG emissions from transport have been the fastest growing in recent years, and transport is perhaps the most difficult sector in which to reduce emissions growth. In the 15 European Union countries, GHG emissions from the transport sector grew by 18% between 1990 and 2000, this compared to a 3% fall in total GHG emissions over the same period. In Annex-1 countries, policies such as the European Biofuels Directive and the Canadian Ethanol Expansion Program have been implemented, at least partially to assist these countries in meeting their Kyoto commitments. Studies (e.g. Marco Aurélio dos Santos) on the energy balance of ethanol production suggest that although the combustion of grain-based ethanol has a positive impact on GHG emissions compared to gasoline, the positive effect on climate change of ethanol derived from sugar cane is greater. Until the technology to produce ethanol from cellulosic feedstocks is widely commercially available, the most efficient ethanol-related reductions in GHGs are therefore likely to occur from ethanol production in tropical countries. Typically tropical countries are non-Annex 1 Parties, and hence the expanded use of fuel ethanol can be targeted by the CDM.

In spite of the potential for the CDM to stimulate fuel ethanol and other liquid bio-fuel production (e.g. bio-diesel) for use in developing countries, to date little action has been taken. The German government was involved in the “100,000 vehicle” project in Brazil (a project which involved the provision of subsidies to stimulate purchases of ethanol-only vehicles), but otherwise very few projects have been mooted. This is for a variety of reasons. Importantly, a fuel ethanol CDM project methodology is not straightforward. The core issues that a fuel ethanol or bio-fuel CDM project methodology must tackle include:

- What is the project activity – Production of ethanol, blending of ethanol with petrol or combustion of ethanol?
- What is the baseline – This is relatively straightforward, and would normally consist of the combustion of gasoline.
- Additionality – Would the project have occurred anyway?
- Leakage – Will the project activity result in higher emissions (or a lower reduction in emissions) elsewhere?
- Carbon impact – How much does the use of ethanol or bio-fuel reduce GHG emissions? This revolves around the thorny issue of bio-fuel energy balances and carbon life-cycle emissions.
- Monitoring – How are emission reductions monitored over a multi-year crediting period?

Despite the above questions and issues, Agrinergy is actively developing a CDM methodology for liquid bio-fuel projects in the transport sector. As mentioned above, a key issue is leakage, particularly in the context of a strictly enforced and fixed mandate for bio-fuel usage. Given this, we are proposing that only under clear and specific circumstances will bio-fuel use qualify as a CDM project.

The author is a director of Agrinergy Ltd., a company set up to assist the bio-energy sector benefit from the CDM. For further information on the CDM, and the opportunities it offers the sugar and bio-fuel industries, contact Agrinergy Ltd.